EXAMINING THE HOUTHI USE OF UNMANNED AERIAL SYSTEMS TO MEET STRATEGIC OBJECTIVES

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Abstract

The Houthis' capability to attack deep within Saudi Arabia with the use of weaponized Unmanned Aerial Vehicles (UAVs) presents a new capability that previous insurgencies have not had. Although every insurgency is different, the Houthi insurgency against the Government of Yemen and Saudi-led coalition is unique in that weaponized UAVs give the insurgency an aerial advantage to strike from extremely long ranges. This research examines whether the Houthis maintain strategic control over Yemen and how UAVs as a tool play a role in that control. Using the factors of international support, domestic support, legitimacy of the government, and territorial control, this research examines how the Houthis employ UAVs to meet each of those strategic objectives in order to take control of Yemen.

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Introduction

Air superiority has played a major role in achieving victory in combat operations since the early 20th century. Control of the skies allows forces access for reconnaissance, swift deployment of logistics, and an ability to defend ground and maritime forces. However, until recently, only rich nation states enjoyed the ability to use aircraft to project power against the enemy. Non-state organizations like the Islamic State and Hezbollah used low cost and commercially available materials to wreak havoc on defense forces as a means to achieve their objectives. Today, state sponsored groups like the Iran-backed Houthis possess the capability to fly drones at exceptionally long distances and project power into Saudi Arabian territory without much risk to insurgent operators. This new technology gives the rebellion a different tool that was not available in past insurgencies. The purpose of this research paper will seek to answer how the Houthis use weapons-capable UAVs as a primary means to exert control over Yemen.

Following a coup d'état in 2014 in which the Houthis successfully took control of Yemen's capital Sanaa, the Saudis publicly backed the Government of Yemen and created a coalition that Crown Prince Mohammed bin Salman promised would put an end to the insurgency.[1] Six years later, the fighting continues and the means of employing weapons to achieve strategic goals on both sides is evolving with lethal consequences. The conflict is often overshadowed in the United States by other tensions in the region,

[1] "Houthis Launch Attacks on Saudi Oil Facilities, Military Sites". 2021. *Al Jazeera*. https://www.aljazeera.com/news/2021/3/26/houthis-say-launched-attacks-on-saudi-arabian-oil-military-sites.

but the repercussions of not studying what is happening in Yemen will have drastic negative impacts for future operations.

Definitions

There are several definitions that this paper assumes to describe key variables. The first definition is that Unmanned Aerial (or Aircraft) Systems (UAS) consist of an unmanned aerial vehicle (UAV) and all the components or support equipment such as data links and navigation equipment that are necessary to actually operate the unmanned aircraft.[2] The UAV is the part of the system that is remotely controlled by a pilot via a ground control system or autonomously with an onboard computer.[3]

While the literature review will detail the factors that will be considered in the span of the research for a successful insurgency, it is important to distinguish between insurgency and terrorism. According to the CIA,

> an insurgency is a protracted political-military struggle directed toward subverting or displacing the legitimacy of a constituted government or occupying power and completely or partially controlling the resources of a territory through the use of irregular military forces and illegal political organizations. The common denominator for most insurgent groups is their objective of gaining control of a population or a particular territory, including its resources.[4]

Terrorism is "premeditated, politically motivated violence perpetrated against noncombatant targets" and though most insurgencies use terrorism as a tactic,[5] including

[2] Yaacoub, Jean-Paul, Hassan Noura, Ola Salman, and Ali Chehab. 2020. "Security Analysis of Drones Systems: Attacks, Limitations, and Recommendations". Internet of Things 11. doi:10.1016/j.iot.2020.100218.
[3] Ibid.
[4] Central Intelligence Agency, *Guide to the Analysis of Insurgency* (Washington, DC: Government Printing Office, 2012). P 1.
[5] Ibid.

some of the groups that this paper discusses in future chapters, this research paper does not explore the merits of characterizing the Houthis as a terrorist organization.

This paper also references the Saudi-led coalition at times. The coalition is composed of mostly Sunni Arab countries that are either involved in combat operations or give some type of support to the coalition. These countries are: Saudi Arabia, United Arab Emirates (UAE), Kuwait, Bahrain, Qatar, Sudan, Egypt, Jordan, Morocco, Pakistan, and Somalia. The United States also contributed material support.[6]

Literature Review

This section analyses the current literature on operational definitions regarding successful insurgencies and the use of Unmanned Aerial Systems (UAS) in asymmetric warfare. While the literature concerning the study of insurgencies spans back decades, the academic literature concerning guerrillas or terrorist use of UAS is much sparser. The research suggests that ISIS was really the first non-state actor to use drones widely and part of this review will identify which non-state actors use UAS as a tool in combat. Through examining the factors that generate a successful insurgency and comparing those factors to the employment of UAS, this research study seeks to understand how the Houthi tactical use of UAS allows them to achieve strategic control over Yemen.

[6] Gambrell, Jon. 2015. "Here Are the Members of the Saudi-Led Coalition in Yemen and What They're Contributing". *Business Insider*. https://www.businessinsider.com/members-of-saudi-led-coalition-in-yemen-their-contributions-2015-3.

Successful Insurgencies

In order to determine an operational definition for "Houthi strategic control over Yemen" this literature review will look at the criteria needed for successful insurgencies and whether the Houthis have met those criteria to achieve strategic control. The term 'insurgency' has no widely agreed definition and varies depending on military branch, government agency, and the broader academic or policy community.[7] However, common themes of an insurgency include the struggle for power and legitimacy, the insurgents' use of violent and nonviolent tools to achieve its goals, and the ultimate objective to psychologically wear down the incumbent to succumb to the demands of the insurgency.[8] These common themes apply to the Houthis in Yemen and thus characterize the movement as an insurgency.

According to a 2010 RAND study that examined 89 insurgent cases, the researchers grouped the insurgencies into four categorizations: Government Loss, Government Victory, Mixed (Stalemate/Negotiated Settlement), and Inconclusive or Ongoing Outcome.[9] Though examining ongoing insurgencies certainly has drawbacks given that the conflict may end abruptly or continue for years, the researchers concluded that "peace is rarely a permanent condition" and that failure to stop an insurgency at its roots allowed some of those movements, such as Shining Path in Peru, to reemerge years

[7] Vick, Alan J., Adam Grissom, William Rosenau, Beth Grill, and Karl P. Mueller. "The Evolving Insurgency Challenge." In *Air Power in the New Counterinsurgency Era: The Strategic Importance of USAF Advisory and Assistance Missions*, 7-26. Santa Monica, CA; Arlington, VA; Pittsburgh, PA: RAND Corporation, 2006. http://www.jstor.org/stable/10.7249/mg509af.10. P 8.
[8] Ibid, p 10.
[9] Connable, Ben, and Martin C. Libicki. "Classifying Outcomes and Selecting Cases." In *How Insurgencies End*, 13-24. RAND Corporation, 2010. http://www.jstor.org/stable/10.7249/mg965mcia.10. Pp 14-20.

later.[10] Similarly, it is often difficult to determine which side won or lost, given the subjectivity of determining when an insurgency is over.[11] This research paper recognizes that the conflict in Yemen is still ongoing and only seeks to clarify whether the Houthis maintain strategic control and if so, what role UAS have in that strategic control.

The RAND study concluded that "it seems that governments defeat themselves more often than they are defeated by a dominant insurgency."[12] This is due to government failures to address an insurgency before it becomes a credible threat as well as root causes for conflict, an inability to extend control into rural areas, or dependency on an inconsistent sponsor.[13] Additionally, external sponsors that fail to address local grievances and root causes or intelligence indicators often have difficulty in sustaining counterinsurgent operations over time and succumb to domestic political pressures.[14] If an insurgency is able to successfully shift the domestic opinion of the sponsored country it is more likely that the sponsor will withdraw forces and end the war.[15] The researchers also go on to note that insurgencies sometimes defeat themselves by falling victim to their own violent tendencies or become overconfident in their ability to defeat the government only to open themselves to a conventional military defeat.[16] An ability to identify a tipping point or other signs that the conflict is turning in favor of an insurgency can help observers determine if the government is losing control.

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[10] Ibid, p 20.
[11] Ibid.
[12] Connable, Ben, and Martin C. Libicki. "Conclusions." In *How Insurgencies End*, 151-56. RAND Corporation, 2010. http://www.jstor.org/stable/10.7249/mg965mcia.14. P 152.
[13] Ibid.
[14] Ibid.
[15] Ibid, p 153.
[16] Ibid.

All-source intelligence collection is necessary in any form of war and professional intelligence organizations have to be able recognize shifts in strategic momentum in a campaign.[17] Although there is rarely a single indicator that signals a major shift in strategic momentum, especially in the complex environments that insurgencies create, tracking defections and observing a greater flow of voluntarily provided human intelligence are possible indicators of a shift from the tactical to the strategic levels of war.[18] Furthermore, the case studies that RAND examined revealed that it was extremely difficult to turn a counterinsurgent campaign once it reached the tipping point.[19] In this case, examining whether the government is past a tipping point to a point of no return can help delineate when exactly an insurgency took strategic control.

Applying certain principles in an insurgency can shift the relative correlation of forces until a tipping point is reached.[20] While each insurgency is unique and requires different methods or tactics to achieve victory, David Spencer notes that principles are universal and that by examining Mao's principles an analyst can better understand an insurgency.[21] One critical principle that Mao espoused was political-military warfare.[22] This principle centers on conducting military operations to achieve a political objective, even if it results in a military failure.[23] For example, the Vietnamese Communist Tet offensive in 1968 against the South Vietnamese Army and US military resulted in a

[17] Ibid, p 155.
[18] Ibid.
[19] Ibid, p 156.
[20] Spencer, David E. "Reexamining the Relevance of Mao to Post-Modern Insurgency and Terrorism." *American Intelligence Journal* 28, no. 1 (2010): 146-52. http://www.jstor.org/stable/44327141. P 148.
[21] Ibid, p 146.
[22] Ibid, p 148.
[23] Ibid, pp 148-149.

tactical defeat for the North Vietnamese, but had larger implications in swaying US public opinion against the war.[24]

According to Steven Metz, the most successful insurgencies in the 20th century were ones which became more and more 'state like' and increased their military capabilities in order to conduct larger operations.[25] This means that while insurgencies initially started as an asymmetric conflict, they eventually became less so as the conflict progressed.[26] Metz describes the necessity of understanding insurgencies in the 21st century, starting with rethinking the strategic context of insurgencies. In the 20th century, insurgencies mattered during the Cold War not only because they amplified Soviet influence, but also because of the symbolism they held. A 'strategic zeitgeist,' or the so-called spirit of an era, had an impact on policymakers that made them fear a climate that accepted the violent overthrow of the existing order.[27] Metz argues that modern insurgencies play a strategic role and are important because of the links to transnational terrorism and the ability to project long-range attacks using terrorist methods against countries who assist the government they are fighting.[28]

Indications that a government defeat is in process include the progressive withdrawal of domestic and international support for the government and the progressive loss of government power over the population and territory.[29] The CIA also lays out

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[24] Ibid.
[25] Metz, Steven. Report. Strategic Studies Institute, US Army War College, 2007. http://www.jstor.org/stable/resrep11642. P 6.
[26] Ibid.
[27] Ibid, p 7.
[28] Ibid, pp 7-8.
[29] Mason, M. Chris. *THE STRATEGIC LESSONS UNLEARNED FROM VIETNAM, IRAQ, AND AFGHANISTAN: Why the Afghan National Security Forces Will Not Hold, and the Implications for the U.S. Army in Afghanistan*. Report. Strategic Studies Institute, US Army War College, 2015. 211-18. http://www.jstor.org/stable/resrep12111.9. P 214.

several additional criteria that signal an imminent insurgent victory, including evidence of the population viewing the government as illegitimate, an increase in international support for the insurgency, massive government desertion, and government willingness to seek a negotiated settlement.[30]

In order to determine the effects that the use of UAVs have on the Houthis ability to maintain strategic control, this research paper will examine the available data on the conflict to conclude if the criteria that signal an imminent insurgent victory are present. The data will address the external support that the current Government of Yemen receives from the Saudi-led coalition and broader international community. Additionally, it will seek to examine whether Houthi use of UAS allows the insurgency to overcome a conventional military defeat and force the Saudi government to the negotiating table. The next section of the literature review addresses the use of UAS in insurgent and asymmetric warfare.

Unmanned Aerial Systems in Asymmetric Warfare

Non-state actors' use of weaponized UAVs is a recent phenomenon that has mainly taken place since August 2016 and almost exclusively only occurs in the Middle East.[31] Additionally, prior research suggests that ISIS and the Houthis were responsible for the majority of cases involving UAV attacks between 2016 and 2020.[32] Air power as a tool was historically reserved for powerful nation-state forces, but the past few years

[30] Central Intelligence Agency, *Guide to the Analysis of Insurgency*. Pp 17-18.

[31] Haugstvedt, Håvard, and Jan Otto Jacobsen. "Taking Fourth-Generation Warfare to the Skies? An Empirical Exploration of Non-State Actors' Use of Weaponized Unmanned Aerial Vehicles (UAVs—'Drones')." Perspectives on Terrorism 14, no. 5 (2020): 26-40. https://www.jstor.org/stable/26940037. P 35.

[32] Ibid.

have changed that assumption, given the wide production of affordable and commercially available UAVs. Since non-state actors' use of UAVs, especially weaponized UAVs, is rapidly developing and is relatively new, there is not as much scholarly literature devoted to the subject compared to other insurgency and terror-related research.[33] This research paper seeks to add to the available literature as insurgents acquire new ways to assert air superiority.

Hezbollah has used UAVs for about 15 years, but it was only in 2016 that the Iran-connected group successfully used a UAV to drop explosives while hovering over its target.[34] The main UAVs that it operates, such as the Iranian-made Ayoub and commercially available DJI Phantom, are used for reconnaissance and kamikaze strikes with explosives.[35] However, the Islamic State in Iraq and Syria (ISIS) was the first non-state actor to use weaponized UAVs extensively for multi-role purposes by modifying existing commercially available quadcopter and fixed-wing drones ranging in the price of US $600 to $1,100.[36] According to propaganda videos, ISIS used "open-source aviation software to plan and execute UAV fights and attacks… however, since the killing of key UAV developers in September 2019… ISIS has halted UAV attacks."[37]

Al-Qaida (AQ) tested remote controlled planes to use chemical weapons, but after Iraqi authorities successfully halted their efforts, there is not much evidence that the group used weaponized UAVs with the exception of a single incident against a Syrian

[33] Haugstvedt, Håvard. "A Flying Threat Coming to Sahel and East Africa? A Brief Review." *Journal of Strategic Security* 14, no. 1 (2020): 92-105. https://www.jstor.org/stable/26999979. P 92.
[34] Ibid, p 93.
[35] Ibid.
[36] Ibid.
[37] Ibid.

military barracks from an AQ affiliate.[38] The Taliban reportedly used UAVs in order to watch US troop movements and in October 2020 the group used UAVs to drop grenades on Afghan security forces.[39] Two other non-state actors, Hay'at Tahrir al-Sham (HTS) and the Free Alawites Movement, both oppose the Assad regime and have claimed to attack the Russian Khmeimim airbase in Syria.[40]

UAVs offer non-state groups a tactical advantage and even "the mere presence of UAVs on the battlefield has also caused distress."[41] Groups can use small or large drones for a specific mission set without much risk to the operators and this includes a psychological aspect. For example, researchers found that in Pakistan, a certain population that lived in an area where UAVs were prevalent agonized about the possibility of being harmed by a deadly strike due to the "widely held belief that UAVs strike with 'surgical precision.'"[42] This allows two advantages for the attackers. Not only can these groups attack from further distances, but psychologically it affects both military operators as well as civilians.[43] A key aspect of this research paper will focus on civilian deaths, since control over the population is one of the factors of a successful insurgency. This paper will examine the use of UAVs against civilian targets in both Yemen and Saudi Arabia in order to discover whether it is a method that the Houthis use to control

[38] Ibid, p 95.
[39] Ibid.

[40] Ibid.
[41] Haugstvedt and Jacobsen. "Taking Fourth-Generation Warfare to the Skies? An Empirical Exploration of Non-State Actors' Use of Weaponized Unmanned Aerial Vehicles (UAVs—'Drones'). P 28.
[42] Ibid.
[43] Ibid.

the country's population and if it is a tactic to change the political discourse in the Kingdom.

The low cost of these technologies also gives non-state actors a greater ability to domestically produce their own weapons-capable UAV. Nation-states such as the United States use modern technology to their advantage with sophisticated weaponry, but researchers estimate that in just a few years "any country will be able to purchase and use relatively advanced UAVs with attack capabilities- a capacity available today to only a small number of countries."[44] Organizations like Hezbollah use weapons-capable UAVs against Israeli defenses and one reason it remains a prominent organization that can employ such a capability is because of its proxy status with Iran.[45] Rebels in Syria use drones that cost upwards of US $1,000 that can broadcast video to a cell phone or smart device and despite its limited capabilities, it nevertheless adds a component of air power that the organization did not previously possess.[46]

Hezbollah has also forced the Israeli Air Force to adjust its radars and defense systems as a result of attacks from these small UAVs.[47] Coupled with various technological methods, Hezbollah may use UAVs to deceive Israeli systems and though a successful strike may be tactically insignificant, it may hold major value in psychologically damaging Israeli citizens.[48] Hezbollah also makes threats to attack strategic targets such as ammonia facilities in Haifa and gas drilling rigs, making it

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[44] Antebi, Liran. *The Quiet Decade: In the Aftermath of the Second Lebanon War, 2006-2016*. Report. Edited by Dekel Udi, Siboni Gabi, and Einav Omer. Institute for National Security Studies, 2017. 83-94. http://www.jstor.org/stable/resrep17017.10. P 86.
[45] Ibid.
[46] Ibid.
[47] Ibid, p 90.
[48] Ibid.

difficult for Israeli air defenses to respond to the wide range of possible targets.[49] Finally, the low signature of these small UAVs makes it difficult for radars to detect, while the low flight altitudes of the drones make it particularly improbable to use fighter jets or missile interceptors to destroy.[50]

UAVs greatly changed the security environment in the 21st century and prior to 2011 only the United States, the United Kingdom, and Israel had armed drones.[51] Between 2011 and 2019, the number of countries with armed UAVs rose to 18, with 11 of those countries having obtained their drones from China.[52] The United States was limited to a 1987 Cold War control regime agreement that made it unable to export systems capable of traveling 300 km with a payload in excess of 500 kg.[53] The inability to export armed drones gave China a market advantage. Additionally, the proliferation of armed UAVs went predominately to non-democracies and after the United States denied the sale of armed drones to countries like the UAE and Saudi Arabia, those countries instead purchased Chinese UAVs.[54]

Summary

The literature on insurgent groups utilizing long-range UAVs is sparse compared to other academic studies of weapons and tactics used by rebellions. While the use of small quadcopters and other commercially available UAVs is documented among non-

[49] Ibid.
[50] Ibid.

[51] Horowitz, Michael, Joshua Schwartz, and Matthew Furhmann. 2020. "China Has Made Drone Warfare Global". *Foreign Affairs*. https://www.foreignaffairs.com/articles/china/2020-11-20/china-has-made-drone-warfare-global
[52] Ibid.
[53] Ibid.
[54] Ibid.

state actors in the Middle East, long-range 'kamikaze' systems are relatively new and are currently being used in ongoing conflicts. This research study aims to help fill the gaps in such literature as the success of such systems may offer insight into how future insurgencies may conduct warfare. Even among state actors, the acquisition of armed UAVs is relatively new, and even then, the literature does not suggest that state actors use UAVs to conduct long-range strikes with the unmanned system as the primary means of inflicting damage.

Hypothesis

As noted in the literature review, non-state actors primarily used UAVs for reconnaissance purposes, but have in recent years weaponized some of these systems for greater lethality. The parts for these UAS are a fraction of the price of sophisticated drones like those used by the United States and give an airborne capability to organizations that previously did not have any. The Houthis, unlike ISIS or al-Qaeda, acquired and employ much more capable UAVs than the quadcopters used to drop grenades. Given that the research demonstrated that many of the Houthis' UAS technology originated in Iran, Hezbollah offers key insights into how the Houthis could use such systems against a conventional military.

Hezbollah forced Israeli defense systems to adjust their posture and also threatened to attack strategic targets. One important aspect is that even if Hezbollah attacks are tactically insignificant, the strike alone can have a psychological impact. This paper will seek to examine the effects that Houthi weapons-capable UAVs have in the areas of driving away international and domestic support for the government as well as its effects on controlling the population and gaining territory. Recognizing that UAS is

simply a tool in a complex situation, this paper makes no conclusions that UAS is the sole instrument to achieve their goals. Instead, it will explore the hypothesis that the Houthis use weapons-capable UAVs as a primary means to exert control over Yemen.

Methods

This research study will examine reporting from the United Nations and other journalist publications on weapons-capable UAVs used by the Houthi insurgency in Yemen. It will be a qualitative analysis and look at each UAV attack as a case study to determine the effects of those strikes in four areas. These four areas include driving away international support for the Saudi-led coalition, furthering a loss of domestic support for the government, delegitimizing the government, and seizing territory from the government.

After a brief overview of the Houthi insurgency, this study examines the types of UAS used by the rebel group as documented by the Combat Armament Research group. The various types of UAS are important to note in the research because this paper does not analyze the effectiveness of UAVs used for intelligence, surveillance, and reconnaissance purposes. Rather, it seeks to address the weapons-capable UAVs in the Houthi inventory and analyze the effects that 'kamikaze' systems have after they are used. If these UAVs are used as a primary means in battle and governance, the data will demonstrate that the Houthis use weapons-capable UAVs to both destroy military targets as well as a means to control the population in their territory.

Although the use of UAS is documented with some non-state actors, there is not much literature that details how insurgents can use UAS to achieve strategic objectives.

Additionally, given the nascency of non-state actors and their ability to acquire or produce UAS, many of the conflicts in which these systems appear are ongoing. This limits some of the data since many areas like Iraq, Syria, and Yemen are embroiled in conflicts where researchers are either limited access or must distinguish conflicted reporting. Furthermore, the documented dishonesty by some of these organizations can make it difficult to rely on certain sources. Still, the advent of social media and the ability to spread news widely gives a good insight into the employment of these weapon systems.

Overview of the Houthi Insurgency

Ansar Allah, the official name of the Houthi insurgency, translates to 'Partisans of God' but is referred to as the Houthi movement since it is led by the Houthi family which adheres to Zaidi Shiism.[55] The Houthis challenged the government of Ali Abdallah Saleh following criticisms of social despair in northern Yemen.[56] The present conflict is rooted in the 2011 Arab Spring uprisings after the Houthis demonstrated against Saleh's government and joined the National Dialogue Conference in an attempt to consolidate a democratic transition.[57] However, both the Saudi Kingdom and other Gulf monarchies through their support behind then Vice-President Abd Rabbo Mansour Hadi, which resulted in widespread conflict and the eventual September 2014 Houthi capture of the capital Sanaa.[58] President Hadi and his government were forced to resign in January 2015

[55] Darwich, May. "The Saudi Intervention in Yemen: Struggling for Status." *Insight Turkey* 20, no. 2 (2018): 125-42. http://www.jstor.org/stable/26390311. P 127.
[56] Ibid.
[57] Ibid, p 128.
[58] Ibid.

and the Houthis declared a new government.[59] Hadi fled Sanaa to Aden but was forced to flee Yemen to Saudi Arabia after the Houthis expanded south and bombed the government headquarters in March 2015.[60]

On 26 March 2015, a Saudi-led coalition conducted "Operation Decisive Storm" and announced that it sought to restore the legitimate government and to save "the Yemeni people from the Houthi aggression."[61] In response, the Houthi's launched a Scud attack in June 2015 that was directed at King Khalid Air Base at Khamis, killing a Saudi Air Force Commander.[62] The Saudi response led to the complete destruction of almost all military bases in Houthi territory, but large weapons caches of surface-to-air and air-to-air missiles were saved and used against the Saudis.[63] In 2017, the alliance between the Houthis and former president Saleh deteriorated. After Saleh requested that his supporters retake the country on 2 December, Houthi forces killed him two days later and effectively took control of pro-Saleh troops after executing the unit commanders.[64]

The Houthi's frequently carry out attacks against the Saudi-led coalition using short-range ballistic missiles (SRBMs), cruise missiles, and UAVs.[65] Hadi and coalition partners were forced to build a new force from every available source still available in government-controlled territory. These forces include tribal militias, Salafi groups, the Islah party, and southerners seeking unification, and are collectively referred to as the

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[59] Alkaff, Syed Huzaifah Bin Othman. "Yemen." *Counter Terrorist Trends and Analyses* 8, no. 1 (2015): 97-101. http://www.jstor.org/stable/26369574. P 98.
[60] Darwich. "The Saudi Intervention in Yemen: Struggling for Status." P 128.
[61] Ibid, pp 128-129.
[62] Amin, Abu. "Crisis in Yemen and Countering Violence." *Counter Terrorist Trends and Analyses* 7, no. 7 (2015): 18-22. http://www.jstor.org/stable/26351372. P 19.
[63] Binnie, Jeremy. 2021. "Six-Year War: The Military Failure in Yemen". London: Jane's Defence Weekly." P 4.
[64] Ibid.
[65] Ibid, p 2.

Popular Resistance.[66] While these forces share a disdain for the Houthis, they often share similar hostilities towards each other.

In 2015, the UAE deployed troops to help the Popular Resistance capture Al-Anad Air Base near Aden and then proceeded westwards to secure the Bab al-Mandab strait and reached the important port city of Al-Hudaydah in June 2018.[67] The port provided the Houthis the ability to smuggle weapons into the country, but it was also significant due to the port being the largest entry point for aid shipments to the humanitarian crisis.[68] Both sides agreed to withdraw from the city in December 2018 and in mid-2019 the UAE announced it was withdrawing most of its forces from the country, creating the opportunity for separatists to take control of government buildings in Aden in a coup d'état and redeploy forces with the Houthis to the south.[69]

Data Analysis

Brigadier General Yahya Saree, the Houthi military spokesman, announced in 2019 that the insurgency had built up its stockpile of UAVs and that "this year will be the year of the drones."[70] Houthi forces have utilized lethal variants of UAVs against the Saudi-led coalition and Hadi-backed forces since 2016.[71] Their ability to domestically produce components and acquire sophisticated material elsewhere place

[66] Ibid, p 5.
[67] Ibid.
[68] Ibid, p 6.
[69] Ibid.
[70] Hambling, David. 2021. "Houthis Step Up Long-Range Drone Attacks on Saudi Oil Facilities". *Forbes*. https://www.forbes.com/sites/davidhambling/2021/03/31/houthis-step-up-long-range-drone-attacks-on-saudi-oil-facilities/?sh=20333599142a.
[71] Conflict Armament Research. 2020. "Evolution of UAVs Employed by Houthi Forces in Yemen". Dispatch From The Field. London: Conflict Armament Research. https://www.conflictarm.com/publications/. P 4.

them on a much more level playing field against Saudi and UAE modern air warfare systems. When the Saudi Air Force entered the conflict in 2015, its US-supplied F15s simply destroyed Houthi aircraft and other Yemeni military hardware captured by the insurgents.[72] However, the Houthi development of long range 'kamikaze' UAVs, such as the Qasef-1, allowed them to launch attacks deep into Saudi Arabia and target critical infrastructure such as oil refineries and airports.[73] This improved ability to take the war into Saudi territory and force the kingdom to modify its air defense capabilities represents a new form of air dominance in insurgent tactics.

Types of Houthi UAVs

Analysis by the Conflict Armament Research (CAR) organization, which works closely with governments to investigate the proliferation of weapons in war zones, documented various types of UAVs employed by Houthi forces. In 2017, CAR reported that Houthi forces utilized unarmed UAVs to crash into sensitive parts of Patriot surface-to-air-missile (SAM) defense systems and have since expanded their UAV inventory to fly greater distances with explosive payloads.[74] In 2019, media reports showed different Houthi UAVs that claimed to be produced in Yemen.[75] CAR reported in 2020 that while the Houthis received most of their UAVs from external sources, they did seem to start manufacturing parts for at least one type of UAV in Yemen in 2018.[76] Figure 1 depicts the documented Houthi-manufactured UAVs.

[72] Hambling. "Houthis Step Up Long-Range Drone Attacks on Saudi Oil Facilities".
[73] Ibid.
[74] Conflict Armament Research. "Evolution of UAVs Employed by Houthi Forces in Yemen". P 4.
[75] Ibid.
[76] Ibid, p 6.

Name	Mission Set
Hudbud-1	Reconnaissance
Qasef-1	Lethal
Qasef-2K	Lethal
Raqib	Reconnaissance
Rased	Reconnaissance
Sammad-1	Reconnaissance
Sammad-2	Lethal
Sammad-3	Lethal

Figure 1 Types of Houthi UAVs. Source: Conflict Armament Research, p 4.

The primary UAVs of focus for this research paper are the Qasef and Sammad variants, given their role in Houthi attacks against the Saudi-led coalition. The Qasef-1 is virtually similar in every way to the Iranian-built Ababil-T UAV and has an estimated maximum range of 200 km.[77] The Houthis first used the Qasef-1 to target Patriot SAM systems and have since modified the UAV to carry fragmentation charges which are initiated in flight and directed at personnel.[78] On 10 January 2019, the Houthi's used a Qasef variant that detonated over Al And Airbase and killed six people.[79]

Houthi forces deployed the Sammad variant in mid-2018 in an endeavor to expand the reach of their UAV inventory. Distinct from the Qasef variant, the Sammad reportedly comes in three types and carries a larger warhead and more powerful engine than the Qasef, giving the Houthis more tactical options.[80] The Sammad has an estimated range of 1,500 km, allowing them to strike at targets outside of Yemeni borders and into Saudi Arabia.[81] In August 2018, the Houthis claimed to have used a Sammad-3 to strike

[77] Ibid.
[78] Ibid, p 8.
[79] Ibid.
[80] Ibid, p 15.
[81] Ibid.

Dubai Airport over 1,200 km away, which the Saudis and UAE denied even though there were reports of disruptions during the alleged attack.[82]

On 26 March 2021, the Houthis claimed that they launched UAV and ballistic missiles into Saudi Arabia that targeted King Abdulaziz military base as well as other military sites and oil facilities owned by Saudi Aramco.[83] Saudi Arabia's defense ministry characterized the attack as "a barrage of eight bomb-carrying drones launched by the Houthi rebels" and despite there being no casualties, the Saudi energy ministry stated that a fuel tank was set ablaze in Jizan.[84] The Houthis announced that they were ready to conduct even more strikes following the attack and declared in a separate statement that they added a new variant of the Sammad (Sammad-4) to its inventory. The new variant reportedly can travel more than 2,000 km and is upgraded to carry two bombs of up to fifty pounds each.[85] Furthermore, the increased range may give the Sammad-4 the ability to take indirect routes to targets, meaning that it could bypass air defense systems that are only anticipating an attack coming from one direction.[86]

At the outset of the conflict, Saudi Arabia and its coalition forces had an upper hand in establishing air superiority and using aircraft at a greater advantage than the insurgency. However, the acquisition and employment of weapons-capable UAVs, especially the Sammad, leveled the playing field for the Houthis. The next chapter of this research paper will look at how the tactical use of these lethal UAVs influence the four major categories that define a successful insurgency and allow the Houthis to maintain

[82] Hambling. "Houthis Step Up Long-Range Drone Attacks on Saudi Oil Facilities".
[83] "Houthis Launch Attacks on Saudi Oil Facilities, Military Sites". *Al Jazeera.*
[84] Ibid.
[85] Hambling. "Houthis Step Up Long-Range Drone Attacks on Saudi Oil Facilities."
[86] Ibid.

strategic control in Yemen. As previously mentioned in the literature review, factors leading to an imminent insurgent victory include evidence of the population viewing the government as illegitimate, an increase in international support for the insurgency, massive government desertion, and government willingness to seek a negotiated settlement. The four main categories that necessitate strategic control are international support, domestic support, government legitimacy, and loss of territory.

Houthi Tactics and International Support

The Houthis' main objective over the past six years has been to bring about an end to the Saudi-led intervention in the country and become the governing power.[87] As mentioned in the literature review section, a key factor for an imminent insurgent victory is the loss of international support to the government and/or a gain of international support for the insurgency. In order to achieve the strategic goal to end the Arab coalition's military intervention, the Houthis have used missile and drone attacks as a means of raising the economic costs for the coalition.[88] The use of long-range UAVs and ballistic missiles to attack Saudi infrastructure is therefore a means to drive the Saudis to the negotiating table to end both the conflict and support for the Government of Yemen.[89]

According to data collected in 2019 by *FDD's Long War Journal*, "the Houthis have launched 58 drone strikes in Saudi Arabia and a further eight inside Yemen."[90] This statistic only documented individual reports and is not representative for the total number

[87] Williams, Ian, and Shaan Shaikh. The Missile War in Yemen. Report. Center for Strategic and International Studies (CSIS), 2020. 10-14. http://www.jstor.org/stable/resrep24837.11. P 10.
[88] Ibid.
[89] Ibid, p 12.
[90] Weiss, Caleb. 2019. "Analysis: Houthi Drone Strikes In Saudi Arabia And Yemen". *FDD's Long War Journal*. https://www.longwarjournal.org/archives/2019/08/analysis-houthi-drone-strikes-in-saudi-arabia-and-yemen.php.

of UAVs used in each strike. However, it is clear that vast majority of attacks are centered on Saudi positions and infrastructure within the Kingdom rather than inside Yemen against the Popular Resistance and government officials. Although Saudi officials claim that the vast majority of UAVs are shot down, it is unlikely the case.[91] Furthermore, this paper argues that even if it is the case that most UAVs could be shot down, the comparative cost would likely drive the Saudis to seek an end to the conflict.

As previously noted, the low cost of these UAVs gives the Houthis an advantage against modern weapons systems. The research shows that many of the UAS are supplied by Iran, a state actor that has considerably more money to spend on such systems than the insurgency despite international sanctions. If the Houthi claim that they are continuing to develop these long-range capabilities with the intent to attack within Saudi Arabian borders is true, then both the cost and attrition of Saudi military defenses are important factors that are influenced by Houthi UAV strikes. Saudi Arabia reportedly spends an estimated US $5-6 billion a month on Yemen operations that include resource-intensive interdictions, and in 2019 the Houthis even launched "Operation Economic Deterrence" with the intent to target Saudi oilfields.[92]

A large part of the Houthi strategy seeks to disrupt the Saudi and UAE economies and the use of ballistic missiles and long-range UAVs allows them to attack oil facilities and tankers.[93] In March, the Houthis launched drones and missiles "at the heart of Saudi Arabia's oil industry" against a Saudi Aramco facility at Ras Tanura, which is also the

[91] Ibid.
[92] Williams and Shaikh. The Missile War in Yemen. Pp 12-13.
[93] Ibid, p 12.

world's largest offshore oil loading facility.[94] This attack also demonstrated the Houthi goal to end the war by not only driving the Saudis out of Yemen, but also crippling the world's energy supply. While this factor is not the only one driving away international support to the Saudi-led coalition, the withdrawal of Emirati forces in 2019 and the push by the United States and the United Nations to end the conflict signal a lack of international support for the Government of Yemen.

Yemen is in the midst of the worst humanitarian crisis in the world right now due to the civil war and external bombing campaign by Arab forces. International support for the Saudi-led coalition is waning and on 4 February, President Joe Biden announced an end for US support to offensive operations in Yemen.[95] In March, Saudi Arabia proposed a ceasefire to the Houthis that conceded to rebel demands to reopen Sanaa International Airport as well as the opening of a joint account at Yemen's Central Bank that gives the Houthis access to taxes and fees generated by Hodeidah port.[96] While the conflict remains in a stalemate, these concessions along with the withdrawal of military support to the Saudi-led coalition indicate one major factor that the Houthis now maintain strategic control over Yemen and used UAVs to achieve that goal.

Houthi Tactics and Domestic Support

The Houthi family and leadership have a wide influence over the territory that it controls. The insurgency recruits "a seemingly endless number of fighters, including

[94] "Houthis Fire Missiles, Drones At Saudi Oil Facilities". 2021. *Al Jazeera*. https://www.aljazeera.com/news/2021/3/7/blast-heard-in-saudi-arabias-dhahran-reports.
[95] Binnie. "Six-Year War: The Military Failure in Yemen". P 2.
[96] "Houthis Launch Attacks on Saudi Oil Facilities, Military Sites". *Al Jazeera*.

children, by drawing on popular support for their war efforts…"[97] However, the Houthis have been accused of egregious violations of international human rights law that includes attacks against civilians, kidnappings, and torture.[98] Additionally, the UN Panel of Experts on Yemen investigated nine incidents where Houthi forces used explosive ordnance against civilians that killed 22 people, including three children, and wounded nearly 200 others.[99] The Houthis also use their weapons systems such as their missile capabilities in their public messaging and propaganda videos on their websites such as al-Masirah and Saba News.[100]

Despite the harsh methods employed by the Houthis to keep the civilian population in its territories under control, the Panel of Experts on Yemen determined that Saudi-led air strikes that kill non-combatants give the Houthis a greater chance to unify the population.[101] The Houthis also maintain a tightly controlled grip on the population through the use of what the Panel described as autocratic state structures and efficient suppression of dissent by using preventative security mechanisms.[102] However, research indicates that while non-state actors like the Houthis may aim to cause mass casualties against soft targets such as civilians, they are unsuccessful at doing so with weaponized UAVs and prefer hard targets instead.[103]

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[97] Lackner, Helen, and Raiman Al-Hamdani. 2020. "Talking To The Houthis: How Europeans Can Promote Peace In Yemen". *European Council On Foreign Relations*. https://ecfr.eu/publication/talking_to_the_houthis_how_europeans_can_promote_peace_in_yemen/.
[98] United Nations Security Council. "Final Report of The Panel of Experts on Yemen". P 3.
[99] Ibid, p 42.
[100] Williams and Shaikh. The Missile War in Yemen. P 13.
[101] United Nations Security Council. "Final Report of The Panel of Experts on Yemen". P 16.
[102] Ibid.
[103]Haugstvedt and Jacobsen. "Taking Fourth-Generation Warfare to the Skies? An Empirical Exploration of Non-State Actors' Use of Weaponized Unmanned Aerial Vehicles (UAVs—'Drones')". P 35.

This paper argues that while the Houthis may use successful strikes against Saudi and government forces for propaganda purposes to legitimize itself, it does not use UAVs as a means of directly attacking the civilian population under its control. Instead, it relies on its administrative authorities and security apparatuses to quell dissent and root out perceived pro-government or pro-Saudi supporters. The group even established the "zainabiyat," an all-female force, to monitor possible female dissidents.[104] While the heavy-handed approach will no doubt be an important factor that warrants examination in any future Houthi-controlled government, the use of UAS has little impact on domestic support for the Houthis and against the government.

Houthi Tactics and Government Legitimacy

Abdrabduh Mansour Hadi's government fails to provide basic services like food distribution and security but infighting amongst government forces continues to erode legitimacy for the government. The 2020 Panel of Experts on Yemen noted that in Ta'izz, the brigades working for the Government of Yemen began fighting with each other.[105] Elements of the 35th Brigade and the Ta'izz military axis fought after a new commander for the brigade was appointed and in December 2019, a new "resistance force" was created that the Panel deemed a threat to the stability in Ta'izz.[106] Adding to the Government of Yemen's own erosion of legitimacy is the Houthi's ability to attack high ranking officials in Yemen's armed forces.

[104] Lackner and Al-Hamdani. "Talking to the Houthis: How Europeans Can Promote Peace in Yemen".
[105] United Nations Security Council. "Final Report of The Panel of Experts on Yemen". P 18.
[106] Ibid, p 19.

On 10 January 2019, the Houthis targeted Al Anad Airbase and killed six people during a military parade with a Qasef-1 UAV.[107] The location of the airbase was about 30 km from Houthi territory, meaning that it was also out of reach for artillery.[108] The attack reportedly injured multiple generals and senior commanders, including the intelligence chief and possibly the Yemeni Government Army Chief of Staff.[109] This event was significant for a number of reasons. First, it demonstrated the Houthi ability to strike soft targets rather than stationary infrastructure which means they only had a limited time to conduct the mission and second, they must have had detailed intelligence about where and when high-ranking officers would be.[110]

In August 2019, the Houthis used missiles and lethal UAVs at another military parade that killed 36 people in Aden, at that time a government stronghold.[111] The military camp belonged to a force backed by the UAE and killed the commander, Brigadier General Muneer al-Yafee.[112] Again, the Houthi ability to attack senior military officials likely indicates internal security failures within the government. While government forces fight amongst themselves, the Houthis continue to use UAVs in conjunction with missile strikes to seize the strategic initiative of de-legitimizing the government.

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[107] Waters, Nick. 2019. "Houthis Use Armed Drone to Target Yemeni Army Top Brass". *Bellingcat*. https://www.bellingcat.com/news/mena/2019/01/10/houthis-use-armed-drone-to-target-yemeni-army-top-brass/.
[108] Ibid.
[109] Ibid.
[110] Ibid.
[111] Ghobari, Mohammed, and Fawaz Salman. 2019. "Houthi Attack Kills More Than 30 In Yemen's Aden, Saudi Blames Iran". *Reuters*. https://www.reuters.com/article/us-yemen-security/houthi-attack-kills-over-30-in-yemens-aden-saudi-blames-iran-idUSKCN1UR3PC.
[112] Ibid.

The successful assassination of senior military officials with a long-range UAV is one of two tactics that the Houthis employ to meet the strategic objective of de-legitimizing the government. The other is the initiative to take the northern city of Marib, an oil-rich region and the government's last stronghold in northern Yemen. The battle for the city is still ongoing, but the Houthi ground campaign still employs UAVs as a tactic to wear down government forces.[113] The loss of Marib would likely be the end of Hadi's government in Yemen.[114] Therefore, the successful tactical use of weaponized UAVs against remaining government forces is a means for the Houthis to achieve strategic control over Yemen.

Houthi Tactics and Loss of Territory

According to the 2020 United Nations Security Council's *Final Report of the Panel of Experts on Yemen*, "the Government of Yemen lost strategic territory to both the Houthis and the Southern Transitional Council" and the territory that the government currently controls is at risk of collapsing or breaking into factions such as that observed in Ta'izz.[115] Despite attempts by the international community to enact a successful ceasefire or end the war, Tim Lenderking, the US special envoy for Yemen, stated that "it appears the Houthis are prioritizing a military campaign to take Marib."[116] However, the

[113] At Least 8 Killed In Marib Blasts, Says Yemeni Official". 2021. *Reuters*. https://www.reuters.com/world/middle-east/big-blast-shakes-yemens-marib-city-centre-residents-say-2021-06-10/.
[114] Binnie. Six-Year War: The Military Failure in Yemen. P 9.
[115] United Nations Security Council. 2021. "Final Report of The Panel of Experts on Yemen". Panel of Experts on Yemen. https://www.securitycouncilreport.org/atf/cf/%7B65BFCF9B-6D27-4E9C-8CD3-CF6E4FF96FF9%7D/S_2021_79.pdf. P 2.
[116] Psaledakis, Daphne, and Jonathan Landay. 2021. "U.S. Yemen Envoy Says Ceasefire Plan Before Houthi Leadership, Urges Response". *Reuters*. https://www.reuters.com/article/yemen-security-usa-int/u-s-yemen-envoy-says-ceasefire-plan-before-houthi-leadership-urges-response-idUSKBN2B41T4.

war has remained in a general stalemate the past couple years and Houthi territorial control resembles the lines of North Yemen prior to 1990.[117]

As noted in previous sections, the Southern Transitional Council's coup d'état in Aden effectively gave control to southern separatists backed by the UAE. Marib and Ta'izz both remain battlegrounds for control over strategic oil resources. In March, the Houthis killed one soldier while injuring 12 others by a weaponized UAV in the Ta'izz governorate.[118] The Houthi offensive to take Marib launched in February 2021 and if they succeed, "the Houthis could claim a strategic win after a largely stalemated battle in almost seven years of war."[119] In response, government forces and the Saudi-led coalition attacked other areas as a way to force the Houthis to spread out and thin their resources.[120] However, Houthi forces have been using weaponized UAVs in conjunction with ballistic missiles to capture the strategic governorate that produces 90 percent of Yemen's petroleum gas.[121]

The Houthis have demonstrated that they will continue to use weaponized UAVs to meet the strategic objective of forcing the government out of territory in order to have complete control. However, the battle for Marib seems to suggest that while the Houthis have an offensive capability in the use of ballistic missiles and weaponized UAVs, the Saudi-led coalition may be able to thin out Houthi forces in battles like Ta'izz, which

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[117] Heistein, Ari. Report. Institute for National Security Studies, 2021. http://www.jstor.org/stable/resrep30659. P 1.
[118] Hatem, Mohammed. 2021. "Yemen: 13 Soldiers Killed And Wounded In A Drone Attack In Taiz". *Bloomberg*. https://www.bloomberg.com/news/articles/2021-03-06/yemen-13-soldiers-killed-and-wounded-in-a-drone-attack-in-taiz.
[119] "Houthi Offensive In Marib Threatens Tens Of Thousands Of Idps". 2021. *Al Jazeera*. https://www.aljazeera.com/news/2021/3/18/yemeni-houthi-offensive-threatens-camps-of-those-who-fled-war.
[120] Ibid.
[121] Ibid.

may limit the number of weaponized UAVs they can employ. Judging by previous data that most lethal UAVs are used against Saudi Arabia, the Houthis may still see loss of international support to the Government of Yemen as its primary priority.

Conclusion

This research paper tested the hypothesis that the Houthis use weapons-capable UAVs as a primary means to exert control over Yemen. This begs the question, do the Houthis have strategic control? The research implies that despite control of the capital and the advantage to strike at targets farther than any other insurgency has before, they still do not hold strategic control over the country. While a tipping point may have already happened and Houthi control is imminent, they have yet to reach full strategic control. The evidence points to a collapsing government that is on the verge of losing control of its forces and position of bargaining power, but the Saudi-led coalition still plays an important role in pushing back against the Houthis.

The second question follows the first in asking what role UAS has over any strategic control? The research suggests that the Houthis use UAS as one of its primary tools to meet its strategic objectives. Since the group does not have strategic control, its main objective is to force the Saudi-led coalition to the negotiating table and out of Yemen. Once the coalition is out of the country, then it stands to reason that the Houthis would continue to use weaponized UAVs against any remaining government forces. However, once again, the end of the war may very well be imminent with the Houthis able to effectively govern northern Yemen, but that full control will only happen once the Saudis permanently withdraw forces.

The broader implications for a Houthi victory will likely impact both irregular and conventional conflicts in the future. Other non-state actors may seek to acquire long-range kamikaze UAVs as a means to either retaliate against government forces or project terror attacks to instill fear. After a container ship blocked the Suez Canal for six days in March, global trade was interrupted, and billions of dollars lost. It is not out of the realm of possibility for non-state actors to target such critical areas in the future to achieve their objectives. There needs to be serious dialogue on how to protect critical infrastructure around the globe from the prospect of being attacked by lethal UAVs, especially across state borders.

Finally, while this research study explicitly examined Yemen, the study of kamikaze UAVs in other ongoing conflicts such as Libya would greatly benefit the academic literature regarding non-state actors and insurgencies. Furthermore, the use of UAS in Iraq by militia groups may offer insight into how non-state organizations use this technology against US troops. No matter what, the trend to use UAS is not going away anytime soon. With all eyes turning to the Great Power Competition, perhaps it is even more important now that the international community understands the impact of how unconventional forces can defeat modern coalitions.

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Curriculum Vitae

Jarrett Benkendorfer was born in 1989 and grew up in Scottsdale, AZ. He graduated with Honors from the University of Arizona in 2012 with a Bachelor of Arts degree in Political Science. Additionally, Jarrett is entering his third year of studying for a Joint Professional Military Education credential at the United States Naval War College. He is an active-duty Naval Flight Officer, having served from 2016-2019 as a Mission Commander and Navigator Instructor with the "World Watchers" of Fleet Air Reconnaissance Squadron ONE (VQ-1) in Whidbey Island, WA. He has flown in the EUCOM, AFRICOM, CENTCOM, and INDOPACOM areas of responsibility, including flying in Operations ODYSSEY LIGHTNING and INHERENT RESOLVE. He currently resides in Alexandria, VA with his wife, son, and two dogs and expects to graduate with his Master of Arts degree in August 2021.